Analysis of the Altman, Springate, Zmijewski, and Grover Methods in Predicting Bankruptcy in Retail Electronics Sub Sector Companies Listed on the Indonesia Stock Exchange for the 2019-2022 Period

Arif Hartono [a,1] , Wahyu Riskina Dita [b,2,*], Ika Farida Ulfah [c,3]

[a,b,c] Universitas Muhammadiyah Ponorogo, Indonesia
[1] arifhrtn@umpo.ac.id *; [2] wahyuriskina.wd@gmail.com; [3] ulfahfaridaika@gmail.com
* corresponding author

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ABSTRACT

Companies with good financial conditions are able to maintain the stability of their operational activities so that profits can increase so that the company avoids the possibility of bankruptcy. The purpose of this study is to predict the potential for bankruptcy using the Altman, Springate, Zmijewski, and Grover methods and to measure the level of accuracy of each method in predicting bankruptcy in Electronic Retail Subsector Companies listed on the IDX for the 2019-2022 period. Bankruptcy is a condition that is not expected to occur in a company where the company is unable to carry out operational activities and its financial management stops. To analyze bankruptcy predictions, researchers use the Altman, Springate, Zmijewski, and Grover methods as measuring tools for predicting potential bankruptcy. This study uses a quantitative analysis method with a descriptive research type. The sample used in this study was 6 Electronic Retail Subsector companies listed on the IDX for the 2019-2022 period with a sampling method using saturated samples. Namely, all members of the population are sampled. The data collection method in this study uses financial report documentation. The results of the study show that the company that is predicted to have the most potential to go bankrupt is PT. Globe Kita Terang tbk using all four prediction methods. The bankruptcy prediction method used in this study with the highest level of accuracy is the Zmijewski and Grover method of 66.67%.

1. Introduction

The era of globalization has an impact on increasingly tight competition between companies in the business world. This competition requires companies to have strategies and innovations to support increased company performance so that they are able to operate for a long period. Technological advances encourage acceleration in meeting everyone's needs, requiring companies to be able to adapt to these advances. Companies are expected to be able to assess the existing situation and take appropriate policies to overcome existing deficiencies so that they are able to remain competitive (Kadim & Sunardi, 2018).

Massive technological shifts require continuing to develop mechanisms for controlling financial management because it is a reflect the company's health condition. The company's main goals are to maximize profits and to be able to operate for a long period. Healthy financial conditions support maximum profit. The measure of a company's financial health is based on the results of an analysis of a company's financial statements over a certain period. All company financial data, including profits and financial position, are presented in the financial reports, able to explain a condition by analyzing the financial reports. As reported on the news page www.cnbcindonesia.com, 48 issuers received the special notation "E". The special notation "E" for these two companies means that the company has high debt and is at risk of incurring losses. Based on this data, of all the listed companies, two are companies in the retail electronics sub-sector, namely PT. Globe Kita Terang tbk and PT. Trikomsel OK tbk.

Looking at these conditions, the researchers chose companies that indicated they were experiencing financial difficulties, where the company's debt was worth more than its total assets and experienced losses during the 2019-2022 period. So, if the company experiences financial difficulties, all of the company's assets will not be able to cover its total debts. This condition occurred in two companies in the retail electronics sub-sector. Another reason related to the choice of the retail electronics sub-sector is technological developments and market competition in the electronics sector faced by companies in the retail electronics sub-sector. Competition in price and quality of goods will become increasingly stringent. This will have an impact on people's purchasing power. Companies must continue to innovate and optimize product quality to improve company performance so that they are able to compete and survive in business (Melissa & Banjarnahor, 2020).

Continuous losses occurring to the company indicate that the company is in a state of financial difficulty. Conditions of financial difficulties that are allowed to persist will lead to bankruptcy. Efforts to anticipate the occurrence of bankruptcy can be made with bankruptcy prediction analysis. Several methods can be used for bankruptcy prediction analysis. Some of them are the Altman, Springate, Zmijewski, and Grover methods. Edward Altman, in 1968, created the Altman Z-Score method after researching financial ratios. His findings revealed five ratios that, when combined, can be used to assess the financial health of bankrupt and nonbankrupt companies (Rudianto, 2013).

The Springate method is another method that can be used to predict whether a company will go bankrupt. Gordon L.V. Springate conducted research in 1978 (Edi & Tania, 2018). According to Rudianto, (2013), the Zmijewski method is a bankruptcy analysis method that refers to calculating ratios that calculate liquidity, leverage, and company performance, as well as the number of debts, to predict bankruptcy. Another bankruptcy prediction method was

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developed by Jeffery S. Grover in 2001, namely the Grover method, which used three financial ratios that were then included in the discriminant equation (Piana & Hidayat, 2023).

Previous research on bankruptcy model analysis in various sectors of the IDX was carried out by Melissa & Banjarnahor, (2020). The research tested the accuracy level of the Altman Z method for forecasting bankruptcy using the Altman Z-score, Springate (S-score), and Zmijewski (X-score) in consumer goods manufacturing companies listed on the IDX from 2014 to 2018. The Zmijewski method received a score of 80%, the Springate method 98%, and a score of 90%, so the Springate method emerged as the most accurate model in this study. Further research was conducted by Piana & Hidayat, (2023) regarding the estimation of bankruptcy of transportation companies using the Altman, Grover and Springate models on the IDX. The findings of this study prove that, in 2018-2021, the transportation business listed on the IDX can be predicted accurately using the Springate and Grover models.

Based on several previous research results, there are still differences in results regarding the level of accuracy of bankruptcy prediction methods. Apart from that, there is also a special notation from the IDX for several companies in the retail electronics sub-sector, which is why the companies are still experiencing losses and have total debts that are higher than their total assets, thereby increasing the potential for companies to go bankrupt. Therefore, researchers are interested in researching bankruptcy predictions by taking the title "Analysis of the Altman, Springate, Zmijewski, and Grover methods in predicting bankruptcy in Retail Electronics Sub Sector companies listed on the Indonesia Stock Exchange for the 2019-2022 period".

2. Literature Review

Financial Statements

According to Kasmir (2018), financial statements are details of the financial condition of a business on a certain date or over a certain period. The information presented in financial reports is used by parties who need it as a consideration in making financial decisions. Financial statements are the company's results of its performance during a period, which are then reflected in a record (Jumingan, 2016).

Financial Statement Analysis

Rabuisa et al., (2018) stated that financial statements analysis is the study of each element of the financial statements to obtain accurate results for the financial statements. Financial statements analysis is the process of measuring the relationship between financial statements components from year to year in order to understand their development (Wulandari, 2017).

Bankruptcy

Melissa & Banjarnahor (2020) revealed that due to the inability to pay off the debts and the lack of capital to continue the company's operational activities, the company experienced bankruptcy. Meanwhile, according to Kadim & Sunardi, (2018), companies that may experience financial difficulties such as disrupted company liquidity (unable to pay salaries or interest on debts), if these difficulties continue to persist, can develop and lead to bankruptcy.

Definition of Bankruptcy Prediction

According to Effendi, (2018) bankruptcy prediction analysis is used by companies to anticipate the possibility of potential bankruptcy caused by financial constraints. Estimating the

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bankruptcy of a company can be done with a threshold of decline in company performance over two to five years to detect potential bankruptcy (Pangkey et al., (2018).

Altman Method Analysis (Z-score)

According to Azzahro & Seomaryono, (2020) the Altman Z-Score method analysis is the result of research completed by Edward I. Altman, which is used as a tool to detect bankruptcy in a company. The Altman method is calculated using the following equation.

Z-score = 0,717Z1 + 0,847Z2 + 3,107Z3 + 0,420Z4 + 0,998Z5 ……(1)

Description:

Z1 = Working Capital / Total Assets
Z2 = Retained Earnings / Total Assets
Z3 = EBIT (Earnings Before Interest and Taxes) / Total Assets
Z4 = Book Value of Equity / Book Value of Debt
Z5 = Sales / Total assets

According to Wahyuni et al., (2023) the criteria for evaluating the Altman method calculation results are:

a. If the Z score <1.23, the company has the potential to go bankrupt
b. If the Z score is between 1.23 and 2.90, the company is in a vulnerable condition
c. If the Z score>2.90, the company has no potential for bankruptcy (healthy)

Springate Method Analysis (S-score)

Gordon L.V. Springate created the Springate (S-score) method in 1978 as a refinement of Altman's method. This method uses four financial ratios selected from nineteen different financial ratios Edi & Tania, (2018).

S-score = 1,03X1 + 3,07X2 + 0,66X3 + 0,4X4 ……(2)

Description:

X1 = Working Capital / Total Assets
X2 = EBIT / Total Assets
X3 = Net profit before tax / Current Debt
X4 = Sales / Total Assets

According to Melissa & Banjarnahor, (2020) the criteria for evaluating the Springate method calculation results are:

a. If the S score <0.862, then the company has a chance of going bankrupt
b. If the S score is > 0.862, then the company is considered healthy.

Zmijewski Method Analysis (X-score)

According to Melissa & Banjarnahor (2020), the Zmijewski method of bankruptcy forecast analysis refers to the calculation of ratios that calculate the liquidity, leverage and performance of a company up to the amount of debt. This method was developed by Mark E. Zmijewski in 1984.

X-score = -4,3 - 4,5X1 + 5,7X2 – 0,004X3 ……(3)

Description:

X1 = Return on Asset (Net Profit / Total Assets)

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X2 = Total Debt/ Total Asset
X3 = Current Asset/ Current Debt

According to Melissa & Banjarnahor, (2020) the criteria for evaluating the Zmijewski method calculation results are:

a. If the value of X > 0 or positive (+), then the company has a chance of going bankrupt
b. If the value of X < 0 or negative (-), then the company is in a healthy condition

Grover Method Analysis (G-score)

According to Piana & Hidayat, (2023) Grover's method is a re-evaluation of Altman's method, which was carried out in 2001 by Jeffey S. Grover.

G-score = 1,650X1 + 3,404X2 – 0,016ROA + 0,057 ……(4)

Description:

X1 = Working capital/ Total Asset
X2 = EBIT (Earnings Before Interest and Taxes) / Total Asset
ROA = Return on Asset (Net Profit / Total Asset)

According to Edi & Tania, (2018) the criteria for evaluating Grover model chategorized as:

a. If G value is ≤ -0.02, so the company has a chance of going bankrupt
b. If G value is ≥ 0.01, so the company is in a healthy condition

3. Research Method

This research is descriptive research, which analyzes data systematically. The object of this research is financial reports for the 2019-2022 period in companies in the retail electronics sub-sector. This research focuses on companies in the retail electronics sub-sector that have been listed on the Indonesian Stock Exchange for the period 2019 to 2022. The population in this study is six companies in the retail electronics sub-sector, so the sampling technique uses a saturated sample; that is, all members of the population are sampled. This research uses secondary data in the form of company financial reports, with documentation techniques as the data collection method.

The data analysis methods used in this research are bankruptcy prediction analysis and prediction accuracy analysis. The bankruptcy prediction analysis used is the Altman, Springate, Zmijewski, and Grover methods. The analysis is carried out by calculating the value for each method and then comparing it with the reality of the company's condition in its financial reports. The calculation results were then analyzed using quantitative descriptive analysis. Descriptive is a systematic data analysis technique, while quantitative contains data in the form of numbers. The figures referred to in this research are financial statements (Financial Statements) for retail electronics sub-sector companies listed on the Indonesia Stock Exchange for the period 2019 to 2022, which were obtained from the Indonesia Stock Exchange website (www.idx.co.id).

Prediction accuracy analysis is carried out by calculating correct predictions and incorrect predictions to test the accuracy of bankruptcy prediction results with conditions in companies in the retail electronics sub-sector. The percentage accuracy rate shows how much the method is able to predict correctly from the sample studied. According to Sari & Yulianto, (2018) , the

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best bankruptcy prediction method has the highest level of accuracy. The level of accuracy is calculated using the following formula:

Accuracy Level = (Number of correct predictions : Number of samples) x 100% (5)

In this research, the error rate of each method was also calculated. The error level used is type II error, which is an error that occurs if a bankruptcy prediction method predicts that the sample will experience bankruptcy. However, in reality, the sample will not experience bankruptcy. Type II error is calculated using the following formula:

Error type II = (Number of type II errors: Number of samples) x 100% ……..(6)

4. Results and Discussion

This research uses the Altman, Springate, Zmijewski, and Grover methods to predict the potential bankruptcy of companies in the retail electronics sub-sector for the 2019-2022 period.

Altman Method

Table 1. Altman Method Bankruptcy Prediction Calculation Results

No	Company	Year				Average	Prediction
		2019	2020	2021	2022		
1	PT. Globe Kita Terang tbk (GLOB)	-94,58355	-106,36679	-93,68437	-153,57280	-112,05188	Potential Bankruptcy
2	PT. Trikomsel Oke tbk (TRIO)	-46,80023	-65,45039	-77,76580	-85,05324	-68,76741	Potential Bankruptcy
3	PT. Gaya Abadi Sempurna tbk (SLIS)	2,35005	1,97444	2,19369	2,40909	2,23182	Vulnerable
4	PT. Damai Sejahtera Abadi tbk (UFOE)	2,70663	2,63507	1,97110	2,23005	2,38571	Vulnerable
5	PT. Elektronik City Indonesia tbk (ECII)	2,57820	2,37381	2,42076	2,72143	2,52355	Vulnerable
6	PT. Erajaya Swasembada tbk (ERAA)	4,44163	4,14795	5,24242	3,83510	4,41678	Healthy

Source: data processed by researchers, 2024

The Altman method bankruptcy index value is in the score category <1.23, where the company is predicted to experience bankruptcy. If the value is between 1.23 and 2.90, it is predicted to be in a vulnerable condition. While the value is >2.90, the company is predicted to be in healthy condition. Based on Table 1 above, two companies are predicted to have the potential to go bankrupt, with the highest potential being PT. Globe Kita Terang tk (GLOB). Meanwhile, three companies are predicted to be in a vulnerable condition, with the most potentially vulnerable condition being PT. Gaya Abadi Perfect tbk (SLIS). Meanwhile, there is one company that is predicted to remain healthy, namely PT. Erajaya Swasembada tbk (ERAA).

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The low Z-score value for companies that have the potential to go bankrupt is because the working capital value of the company is low to negative. This means that current liabilities are greater than the current assets owned. If this condition occurs continuously, it can cause difficulties in paying off current debts and disrupt operational activities.

Springate Method

Table 2. Springate Method Bankruptcy Prediction Calculation Results

No	Company	Year				Average	Prediction
		2019	2020	2021	2022		
1	PT. Globe Kita Terang tbk (GLOB)	-22,25812	-37,23194	-38,92078	-73,32369	-42,93363	Potential Bankruptcy
2	PT. Trikomsel Oke tbk (TRIO)	-3,37448	-8,35364	-11,94303	-17,01730	-10,17211	Potential Bankruptcy
3	PT. Elektronik City Indonesia tbk (ECII)	0,73932	0,62532	0,74205	0,85271	0,73985	Potential Bankruptcy
4	PT. Damai Sejahtera Abadi tbk (UFOE)	1,25043	1,07167	0,72027	0,86980	0,97804	Healthy
5	PT. Gaya Abadi Sempurna tbk (SLIS)	1,66171	1,36151	1,49463	1,76303	1,57022	Healthy
6	PT. Erajaya Swasembada tbk (ERAA)	1,91034	1,85780	2,41980	1,72488	1,97821	Healthy

Source: data processed by researchers, 2024

The Springate method bankruptcy index value with a score category of <0.862 indicates that the company is predicted to experience bankruptcy. If it is in the score category >0.862, the company is predicted to be in healthy condition. Based on Table 2 above, there are three companies predicted to have the potential to go bankrupt, with the company with the most potential to go bankrupt being PT. Globe Kita Terang tbk (GLOB), three companies are predicted to be in a healthy condition, the healthiest prediction being PT. Erajaya Swasembada tbk (ERAA).

The low S-score value for companies that have the potential to go bankrupt is because the working capital value of the company is low to negative. This means that current liabilities are greater than the current assets owned. If this condition occurs continuously, it can cause difficulties in paying off current debts and disrupt operational activities.

Metode Zmijewski

Table 3. Zmijewski Method Bankruptcy Prediction Calculation Results

No	Company	Year				Average	Prediction
		2019	2020	2021	2022		
1	PT. Globe Kita Terang tbk (GLOB)	535,93546	449,99465	383,76037	610,50054	495,04776	Potential Bankruptcy
2	PT. Trikomsel Oke tbk (TRIO)	159,53695	216,04902	250,65087	225,93499	213,04296	Potential Bankruptcy

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3	PT. Damai Sejahtera Abadi tbk (UFOE)	-0,93425	-0,98560	-1,14811	-1,34673	-1,10367	Healthy
4	PT. Erajaya Swasembada tbk (ERAA)	-1,68011	-1,76711	-2,28763	-1,29581	-1,75766	Healthy
5	PT. Gaya Abadi Sempurna tbk (SLIS)	-1,53357	-1,57311	-1,84612	-2,18123	-1,78351	Healthy
6	PT. Elektronik City Indonesia tbk (ECII)	-2,95211	-2,68263	-2,83961	-2,65837	-2,78318	Healthy

Source: data processed by researchers, 2024

The bankruptcy index value of the Zmijewski method with a score category > 0 or positive value means the company is predicted to experience bankruptcy. If it is in the score category <0 or has a negative value, the company is predicted to be in a healthy condition. Based on Table 3 above, three companies are predicted to have the potential to go bankrupt, with the company with the most potential to go bankrupt being PT. Globe Kita Terang tbk (GLOB), while three companies are predicted to be in a healthy condition/The company predicted to be the healthiest is PT. Electronic City Indonesia Tbk (ECII).

The low X-score value for companies that have the potential to go bankrupt is because the working capital value of the company is low to negative. This means that current liabilities are greater than the current assets owned. If this condition occurs continuously, it can cause difficulties in paying off current debts and disrupt operational activities in the financial position report of PT. Globe Kita Terang tbk and PT. Trikomsel Oke Tbk shows that the number of assets owned by the company is lower than the number of liabilities. These conditions cause the value of the ratio of total debt to total assets used by the Zmijewski method to be very high during the 2019-2022 period. So, most of the company's operations are financed by debt.

Grover Method

Table 4. Grover Method Bankruptcy Prediction Calculation Results

No	Company	Year				Average	Prediction
		2019	2020	2021	2022		
1	PT. Globe Kita Terang tbk (GLOB)	-55,30228	-61,46703	-64,45862	-121,75002	-75,74449	Potential Bankruptcy
2	PT. Trikomsel Oke tbk (TRIO)	-9,35239	-15,04372	-21,69709	-31,62661	-19,42995	Potential Bankruptcy
3	PT. Damai Sejahtera Abadi tbk (UFOE)	0,57159	0,20711	0,03357	0,17044	0,24568	Sehat
4	PT. Elektronik City Indonesia tbk (ECII)	0,46142	0,52948	0,61240	0,57982	0,54578	Healthy
5	PT. Erajaya Swasembada tbk (ERAA)	0,72203	0,74484	0,89234	0,62618	0,74635	Healthy
6	PT. Gaya Abadi Sempurna tbk (SLIS)	1,29532	1,14361	1,28702	1,49110	1,30426	Healthy

Source: data processed by researchers, 2024

The Grover method bankruptcy index value with a score category of ≤-0.02 means the company is predicted to experience bankruptcy. If it is in the score category ≥0.01, then the company is predicted to be in healthy condition. Based on Table 4 above, three companies are predicted to have the potential to go bankrupt, with the company with the most potential to go bankrupt being PT. Globe Kita Terang tbk (GLOB), three companies are predicted to be in healthy condition, and PT is the healthiest. Gaya Abadi Perfect tbk (SLIS).

The low G-score value for companies that have the potential to go bankrupt is because the working capital value of the company is low to negative. This means that current liabilities are greater than the current assets owned. If this condition occurs continuously, it can cause difficulties in paying off current debts and disrupt operational activities. In the profit and loss reports, companies that are predicted to have the potential to go bankrupt are still recorded as experiencing losses during 2019-2022. These losses cause the calculation of the ROA (Return on Assets) ratio used in the Grover method to obtain a low value. The low value of this ratio indicates that the company has yet to be able to utilize all its assets to generate profit or profit.

Level of Accuracy and Type II Error

Level of Accuracy and Type II Error – Altman Method

Table 5. Results of Calculation of Level of Accuracy and Type II Error Altman Method

Recapitulation	Prediction			Total
	Potential Bankruptcy	Vulnerable	Healthy	
Altman method calculation	2	3	1	6
Total	2	3	1	6
Level of accuracy	(1/6) x100%	= 16,67%		
Type II Error	(2/6) x100%	= 33,33%		
Vulnerable	(3/6) x100%	= 50%		

Source: data processed by researchers, 2024

The results of calculating the level of accuracy and error type II in Table 5 show that the calculation of bankruptcy predictions for companies in the retail electronics sub-sector listed on the Indonesia Stock Exchange for the 2019-2022 period using the Altman Z-Score method has an accuracy level of 16.67% with Error Type II is worth 33.33%. This means that the Altman method is able to predict correctly according to the real conditions of the company with a percentage of 16.67% or 1 out of 6 companies predicted correctly using the Altman Z-Score method. The error rate in the Altman method, where the sample company is predicted to have the potential to go bankrupt but in reality does not go bankrupt with a percentage of 33.33% or 2 out of 6 companies are declared bankrupt, but in reality, the company does not go bankrupt.

Level of Accuracy and Type II Error –Springate Method

Table 6. Results of Calculation of Level of Accuracy and Type II Error Springate Method

Recapitulation	Prediction		Total
	Potential Bankruptcy	Healthy	
Springate Method Calculation	3	3	6
Total	3	3	6
Level of accuracy	(3/6) x 100%	= 50%	
Type II Error	(3/6) x 100%	= 50%	

Source: data processed by researchers, 2024

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The results of calculating the level of accuracy and type II error in Table 6 show that the calculation of bankruptcy predictions for companies in the retail electronics sub-sector listed on the Indonesia Stock Exchange for the 2019-2022 period using the Springate method has an accuracy level of 50% with a Type II error of 50%. This means that the Springate method is able to predict correctly according to the real conditions of the company, with a percentage of 50% or 3 out of 6 companies predicting correctly using the Springate method. The error rate in the Springate method, where the sample company is predicted to have the potential to go bankrupt but in reality does not go bankrupt with a percentage of 50% or 3 out of 6 companies are declared bankrupt, but in reality, the company does not go bankrupt.

Level of Accuracy and Type II Error –Zmijewski Method

Table 7. Results of Calculation of Level of Accuracy and Type II Error Zmijewski Method

Recapitulation	Prediction		Total
	Potential Bankruptcy	Healthy	
Zmijewski Method Calculation	2	4	6
Total	2	4	6
Level of accuracy	(4/6) x 100%	= 66,67%	
Type II Error	(2/6) x 100%	= 33,33%	

Source: data processed by researchers, 2024

The results of calculating the level of accuracy and type II error in Table 6 show that the calculation of bankruptcy predictions for companies in the retail electronics sub-sector listed on the Indonesia Stock Exchange for the 2019-2022 period using the Zmijewski method has an accuracy level of 66.67% with a Type II error of 66.67%. 33.33%. This means that the Zmijewski method is able to predict correctly according to the real conditions of the company, with a percentage of 66.67% or 4 out of 6 companies predicted correctly using the Zmijewski method. The error rate in the Zmijewski method, where the sample company is predicted to have the potential to go bankrupt but in reality does not go bankrupt with a percentage of 33.33% or 2 out of 6 companies are declared bankrupt, but in reality, the company does not go bankrupt..

Level of Accuracy and Type II Error –Grover Method

Table 8. Results of Calculation of Level of Accuracy and Type II Error Grover Method

Recapitulation	Prediction		Total
	Potential Bankruptcy	Healthy	
Grover Method Calculation	2	4	6
Total	2	4	6
Level of accuracy	(4/6) x 100%	= 66,67%	
Type II Error	(2/6) x 100%	= 33,33%	

Source: data processed by researchers, 2024

The results of calculating the level of accuracy and type II error in Table 6 show that the calculation of bankruptcy predictions for companies in the retail electronics sub-sector listed on the Indonesia Stock Exchange for the 2019-2022 period using the Grover method has an accuracy level of 66.67% with a Type II error of 66.67%. 33.33%. This means that the Grover method is able to predict correctly according to the real conditions of the company, with a percentage of 66.67% or 4 out of 6 companies predicted correctly using the Grover method. The error rate in the Grover method, where the sample company is predicted to have the potential to go bankrupt but in reality does not go bankrupt with a percentage of 33.33% or 2 out of 6 companies are declared bankrupt, but in reality, the company does not go bankrupt.

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Recapitulation of Accuracy Level and Type II Error Results

The following are the recapitulation results of the level of accuracy and type II error to measure the ranking of bankruptcy prediction methods in predicting bankruptcy in companies in the retail electronics sub-sector for the 2019-2022 period:

Table 9. Recapitulation of Accuracy Level Results and Type II Error Bankruptcy Prediction Methods

Rankings	Prediction Method	Level of accuracy	Type II Error	Vulnerable Condition	Description
1	Zmijewski and Grover	66,67%	33,33%	-	The Zmijewski and Grover method is able to predict companies in the retail electronics sub-sector according to actual (real) company conditions with a percentage of 66.67%. The level of prediction error in predicting samples that are experiencing potential bankruptcy is 33.33% of the total sample. When compared with the four other bankruptcy prediction methods, the Zmijewski and Grover methods have the same level of accuracy, and their accuracy is better than that of the Altman and Springate methods.
2	Springate	50%	50%	-	The Springate method is able to predict companies in the retail electronics sub-sector according to actual (real) company conditions with a percentage of 50%. The Springate method has a prediction error rate for companies experiencing potential bankruptcy with a percentage of 50% of the total sample. When compared with the four other bankruptcy prediction methods, the Springate method has a better level of accuracy than the Altman method.
3	Altman	16,67%	33,33%	50%	The Altman method is able to predict companies in the retail electronics sub-sector according to actual (real) company conditions with a percentage of 16.67%. The Altman method has a prediction error rate in seeing potential bankruptcy with a percentage of 33.33% of the total sample and companies predicted to be in a vulnerable condition of 50% of the total sample. When compared with the four other bankruptcy prediction methods, the Altman method has the lowest level of accuracy.

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Source: data processed by researchers, 2024

The recapitulation results of the level of accuracy and type II error in Table 8 explain that the bankruptcy prediction method with the highest level of accuracy is the Zmijewski and Grover method, with a percentage of 66.67%. Furthermore, the Springate method has an accuracy rate of 50%. Meanwhile, the Altman method has the smallest percentage among the four methods used in this research, with a percentage of 16.67%. So, from this explanation, the Zmijewski and Grover method is the most accurate method to use as a bankruptcy prediction method for companies in the retail electronics sub-sector, with a percentage accuracy rate of 66.67%.

5. Conclusion

Prediction of potential bankruptcy in retail electronics sub-sector companies measured using the Altman, Springate, Zmijewski, and Grover methods during the 2019-2022 period. There are several prediction results for retail electronics companies that have the potential to go bankrupt using these four prediction methods. Based on the research results, the following conclusions were obtained:

a. There are differences in the calculation results for the four prediction methods used. The bankruptcy prediction results of the Altman, Zmijewski, and Grover methods obtained the same results, namely two companies predicted to have the potential to go bankrupt, namely PT—Trikomsel Oke Tbk. Meanwhile, the Springate method predicts three companies that have the potential to go bankrupt, namely PT—Electronic City Indonesia Tbk.
b. The bankruptcy prediction results using the Altman, Springate, Zmijewski, and Grover methods show that the company predicted to have the greatest potential for bankruptcy is PT. Globe Kita Terang tk. If we look at the suitability of the financial report data support as measured by liquidity and profitability analysis, it shows that the company's financial performance is low. This is because the company recorded continuous losses during 2019-2022, and the total assets owned by the company were very low. If the company is in financial difficulties, the company's entire debt cannot be paid off by the assets it owns—the high debt owned by PT. Globe Kita Terang tk caused an increase in the debt ratio calculation. This means that a company is very vulnerable to experiencing financial difficulties when the amount of debt exceeds all its assets.

The results of calculating the accuracy level of bankruptcy predictions using the Altman, Springate, Zmijewski and Grover methods show that the Zmijewski and Grover methods have the highest level of accuracy in making bankruptcy predictions with a percentage of 66.67%. Then, the Springate method obtained an accuracy level of 50%. Meanwhile, the Altman method obtained an accuracy level of 16.67%.

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